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READ CAREFULLY
POINT 8 (FCB bit management)

To set the device in Mb1 / Mb2 : read user manual
Mb2 : default

Rev	DESCRIPTION	Date	Sw
B	Formal revision Added point 8	30/06/2016	≥ 3.0

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1. Standard M-Bus telegrams (Mb2)

1.1 Request for Data (REQ_UD2)

REQ_UD2	
CODE	**Description**
10h	Start
5B/7Bh	C field : Request for Data
PADR	A field : device address 0..250 /254
CS	CheckSum = (10h+5B/7Bh+PADR) mod 100h
16h	Stop

See in the following the table the summary of the 3 basic telegrams.

	RSP_UD - 1st message									
Symbol	**Sequence**	**UNIT**	**DIF**	**DIFE(1)**	**DIFE(2)**	**DIFE(3)**		**VIF**	**VIFE**	**FORMAT**
Et+	Active positive energy	0	0x04					0x84	0X3B	INT 32
P+	Active positive power	0	0x04					0xAB	0x3B	INT 32
P-	Active negative power	0	0x04					0xAB	0x3C	INT 32
Er+	Reactive positive energy	1	0x84	0x40				0x84	0X3B	INT 32
Q+	Reactive positive power	1	0x84	0x40				0xAB	0x3B	INT 32
Q-	Reactive negative power	1	0x84	0x40				0xAB	0x3C	INT 32
Part Et+	Active partial positive energy	2	0x84	0x80	0x40			0x84	0X3B	INT 32
Part Er+	Reactive partial positive energy	3	0x84	0xC0	0x40			0x84	0x3B	INT 32
	RSP_UD - 2nd message									
	Sequence	**UNIT**	**DIF**	**DIFE(1)**	**DIFE(2)**	**DIFE(3)**		**VIF**	**VIFE**	**FORMAT**
L1-N	V1	2	0x84	0x80	0x40			0xFD	0x48	INT 32
I1	I1	2	0x84	0x80	0x40			0xFD	0x59	INT 32
P1+	P1	2	0x84	0x80	0x40			0xAB	0x3B	INT 32
P1-	P1-negative	2	0x84	0x80	0x40			0xAB	0x3C	INT 32
L2-N	V2	3	0x84	0xC0	0x40			0xFD	0x48	INT 32
I2	I2	3	0x84	0xC0	0x40			0xFD	0x59	INT 32
P2+	P2	3	0x84	0xC0	0x40			0xAB	0x3B	INT 32
P2-	P2-negative	3	0x84	0xC0	0x40			0xAB	0x3C	INT 32
L3-N	V3	4	0x84	0x80	0x80	0x40		0xFD	0x48	INT 32
I3	I3	4	0x84	0x80	0x80	0x40		0xFD	0x59	INT 32
P3+	P3	4	0x84	0x80	0x80	0x40		0xAB	0x3B	INT 32
P3-	P3-negative	4	0x84	0x80	0x80	0x40		0xAB	0x3C	INT 32
L1-L2	V12	5	0x84	0xC0	0x80	0x40		0xFD	0x48	INT 32
Q1+	Q1	5	0x84	0xC0	0x80	0x40		0xAB	0x3B	INT 32
Q1-	Q1-negative	5	0x84	0xC0	0x80	0x40		0xAB	0x3C	INT 32
L2-L3	V23	6	0x84	0x80	0xC0	0x40		0xFD	0x48	INT 32
Q2+	Q2	6	0x84	0x80	0xC0	0x40		0xAB	0x3B	INT 32
Q2-	Q2-negative	6	0x84	0x80	0xC0	0x40		0xAB	0x3C	INT 32
L1-L3	V13	7	0x84	0xC0	0xC0	0x40		0xFD	0x48	INT 32
Q3+	Q3	7	0x84	0xC0	0xC0	0x40		0xAB	0x3B	INT 32
Q3-	Q3-negative	7	0x84	0xC0	0xC0	0x40		0xAB	0x3C	INT 32

	RSP_UD - 3rd message									
	Sequence	**UNIT**	**DIF**	**DIFE(1)**	**DIFE(2)**	**DIFE(3)**	**DIFE(4)**	**VIF**	**VIFE**	
PF	Power factor	8	0x82	0x80	0x80	0x80	0x40	0xEE	0x3B	INT 16
PF-	Power factor -	8	0x82	0x80	0x80	0x80	0x40	0xEE	0x3C	INT 16
Fr	Frequency	9	0x82	0xC0	0x80	0x80	0x40	0x6E		INT 16
	Current ratio (KTA)	10	0x84	0x80	0xC0	0x80	0x40	0x6E		INT 32
	Voltage ratio (KTV)	11	0x84	0xC0	0xC0	0x80	0x40	0x6E		INT 32
PF1	Power factor L1	12	0x82	0x80	0x80	0xC0	0x40	0xEE	0x3B	INT 16
PF1-	Power factor L1-	12	0x82	0x80	0x80	0xC0	0x40	0xEE	0x3C	INT 16
PF2	Power factor L2	13	0x82	0xC0	0x80	0xC0	0x40	0xEE	0x3B	INT 16
PF2-	Power factor L2-	13	0x82	0xC0	0x80	0xC0	0x40	0xEE	0x3C	INT 16
PF3	Power factor L3	14	0x82	0x80	0xC0	0xC0	0x40	0xEE	0x3B	INT 16
PF3-	Power factor L3-	14	0x82	0x80	0xC0	0xC0	0x40	0xEE	0x3C	INT 16

Answer to Request for Data (REQ_UD2)

Position	Description	Byte	Data type
1	3-phase Active Positive Energy	4	**Type B , Binary Integer**
2	3-phse Active Positive Power	4	
3	3-phase Active Negative Power	4	**TELEGRAM 1**
4	3-phase Reactive Positive Energy	4	
5	3-phase Reactive Positive Power	4	
6	3-phase Reactive Negative Power	4	
7	3-phase Active Partial Energy	4	
8	3-phase Reactive Partial Energy	4	
9	3-phase Active Negative Energy	4	
10	3-phase Reactive Negative Energy	4	
11	special	5	
12	Voltage L1	4	**Type B , Binary Integer**
13	Current I1	4	
14	Active Power L1	4	**TELEGRAM 2**
15	Negative Active Power L1	4	
16	Voltage L2	4	
17	Current I2	4	
18	Active Power L2	4	
19	Negative Active Power L2	4	
20	Voltage L3	4	
21	Current I3	4	
22	Active Power L3	4	
23	Negative Active Power L3	4	
24	Voltage L1-L2	4	
25	Reactive Power L1	4	
26	Negative Reactive Power L1	4	
27	Voltage L2-L3	4	
28	Reactive Power L2	4	
29	Negative Reactive Power L2	4	
30	Voltage L3-L1	4	
31	Reactive Power L3	4	
32	Negative Reactive Power L3	4	
33	special	5	
34	Power Factor	2	**Type B , Binary Integer**
35	Negative power factor	2	
36	Frequency	2	**TELEGRAM 3**
37	Current Transform Ratio KTA	4	
38	Voltage Transform Ratio KTV	4	
39	Power Factor L1	2	
40	Negative Power Factor L1	2	
41	Power Factor L2	2	
42	Negative Power Factor L2	2	
43	Power Factor L3	2	
44	Negative Power Factor L3	2	
45	Special	5	

1.2 Details of telegrams 1,2,3

Details of the telegrams (all values are hexadecimal).

1.2.1 Telegram 1

	RSP_UD			
	Field Name	**Byte n.**	Value	**Meaning**
	Start	1	68	Start byte
	L-f	1	LEN	Frame number byte
	L-f	1	LEN	Frame number byte
	Start	1	68	Start byte
	C-f	1	08	RSP_UD
	A-f	1	PADR	0..250
	CI-f	1	72	Variable structure ,LSB is trasmitted first
	Secondary address	4	IDENT	XXXXXXXX (8 BCD digits)
	Manufacturer code	2	A5 25	"IME" = 25A5
	Device version	1	GEN	Version
	Medium	1	02	Electricity
	Access number	1	TC	incremented by 1 for any aswered telegram
	Status	1	STAT	Status for EN 1434-3 (*)
	Signature	2	00 00	Not used
Et +	DIF	1	04	Instantaneous Value, 32 bit Integer
	VIF	1	84	Units kWh with resolution 10 Wh
	VIFE (1)	1	3B	
	Value	4	xxxxxxxx	3-phase Active Positive Energy
P +	DIF	1	04	Instantaneous Value, 32-bit Integer
	VIF	1	AB	W
	VIFE (1)	1	3B	Accumulation only if positive contribution
	Value	4	xxxxxxxx	3-phase Active Positive Power
P –	DIF	1	04	Instantaneous Value, 32-bit Integer
	VIF	1	AB	W
	VIFE (1)	1	3C	Accumulation of abs value only if negative contribution
	Value	4	xxxxxxxx	3-phase Active Negative Power
Er +	DIF	1	84	Instantaneous Value, 32 bit Integer
	DIFE (1)	1	40	Unit 1
	VIF	1	84	kvarh with resolution 10 varh
	VIFE (1)	1	3B	Accumulation only if positive
	Value	4	xxxxxxxx	3-phase Reactive Positive Energy
Q +	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	40	Unit 1
	VIF	1	AB	var
	VIFE (1)	1	3B	Accumulation only if positive
	Value	4	xxxxxxxx	3-phase Reactive Positive Power
Q -	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	40	Unit 1
	VIF	1	AB	var
	VIFE (1)	1	3C	Accumulation of abs value only if negative contribution
	Value	4	xxxxxxxx	3-phase Reactive Negative Power
Part Et +	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	40	
	VIF	1	84	kWh with resolution 10Wh
	VIFE (1)	1	3B	Accumulation only if positive contribution
	Value	4	xxxxxxxx	3-phase Partial Active Positive Energy
Part Er+	DIF	1	84	Instantaneous Value, 32 bit Integer
	DIFE (1)	1	C0	
	VIF	1	40	kVArh with resolution 0,01k/0,1k VArh
	VIFE	1	84	

	VIFE (1)	1	3B	Accumulation only if positive contribution
	Value	4	xxxxxxxx	3-phase Partial Reactive Positive Energy
3-phase Et -	DIF	1	84	Instantaneous Value, 32 bit Integer
	DIFE (1)	1	80	
	DIFE	1	80	
	DIFE (3)	1	40	Unit 4
	VIF	1	84	kVArh with resolution 10VArh
	VIFE (1)	1	3C	Accumulation of abs value only if negative contribution
	Value	4	xxxxxxxx	3-phase Active Negative Energy
3-phase Er –	DIF	1	84	Instantaneous Value, size 32 bit Integer
	DIFE (1)	1	C0	
	DIFE (2)	1	80	
	DIFE (3)	1	40	Unit 5
	VIF	1	84	kVArh with resolution 10VArh
	VIFE (1)	1	3C	Accumulation of abs value only if negative contribution
	Value	4	xxxxxxxx	3-phase Reactive Negative Energy
	DIF	1	1F	more records will follow in next telegram
	Value	5	0000000000	PAD bytes
	Checksum	1	CS	
	Stop	1	16	

1.2.2 Telegram 2

	RSP_UD			
	Field Name	**Byte Number**	Value	**Meaning**
	Start	1	68	Start byte
	L-f	1	LEN	Frame number byte
	L-f	1	LEN	Frame number byte
	Start	1	68	Start byte
	C-f	1	08	RSP_UD
	A-f	1	**PADR**	0..250
	CI-f	1	72	Variable structure,LSB is trasmitted first
	Secondary address	4	IDENT	XXXXXXXX (8 BCD digits)
	Manufacturer code	2	A5 25	"IME" = 25A5
	Device version	1	**GEN**	Version
	Medium	1	02	Electricity
	Access number	1	TC	**incremented by 1 for any aswered telegram**
	Status	1	STAT	Status for EN 1434-3 (*)
	Signature	2	00 00	**Not used**
L1 - N	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE	1	80	
	DIFE	1	40	Units 2
	VIF	1	FD	Extension of VIF code
	VIFE (1)	1	48	0.1 V
	Value	4	xxxxxxxx	Voltage L1-N
I 1	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE	1	80	
	DIFE	1	40	Unit 2
	VIF	1	FD	Extension of VIF code
	VIFE (1)	1	59	mA
	Value	4	xxxxxxxx	Current L1
P 1 +	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE	1	80	
	DIFE	1	40	Unit 2
	VIF	1	AB	W
	VIFE (1)	1	3B	Accumulation only if positive contribution
	Value	4	xxxxxxxx	Positive Active Power Line 1
P1 -	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	80	
	DIFE (2)	1	40	Unit 2
	VIF	1	AB	W
	VIFE (1)	1	3C	Accumulation of abs value only if negative contribution
	Value	4	xxxxxxxx	Negative Active Power Line 1
L2 - N	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE	1	C0	
	DIFE	1	40	Unit 3
	VIF	1	FD	Extension of VIF code
	VIFE	1	48	0.1 V
	Value	4	xxxxxxxx	Voltage L2-N
I 2	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	C0	
	DIFE (2)	1	40	Unit 3
	VIF	1	FD	Extension of VIF code
	VIFE (1)	1	59	mA
	Value	4	xxxxxxxx	Current L2

P 2 +	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	C0	
	DIFE (2)	1	40	Unit 3
	VIF	1	AB	W
	VIFE (1)	1	3B	Accumulation only if positive contribution
	Value	4	xxxxxxxx	Positive Active Power Line 2
P2 -	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	C0	
	DIFE (1)	1	40	Unit 3
	VIF	1	AB	W
	VIFE (1)	1	3C	Accumulation of abs value only if negative contribution
	Value	4	xxxxxxxx	Negative Active Power Line 2
L3 - N	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	80	
	DIFE (2)	1	80	
	DIFE (3)	1	40	Unit 4
	VIF	1	FD	Extension of VIF code
	VIFE (1)	1	48	0.1 V
	Value	4	xxxxxxxx	Voltage L3-N
I 3	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	80	
	DIFE (2)	1	80	
	DIFE (3)	1	40	Unit 4
	VIF	1	FD	Extension of VIF code
	VIFE (1)	1	59	mA
	Value	4	xxxxxxxx	Current L3
P 3 +	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	80	
	DIFE (2)	1	80	
	DIFE (3)	1	40	Unit 4
	VIF	1	AB	W
	VIFE	1	3B	Accumulation only if positive contribution
	Value	4	xxxxxxxx	Positive Active Power Line 3
P3 -	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	80	
	DIFE (2)	1	80	
	DIFE (3)	1	40	Unit 4
	VIF	1	AB	W
	VIFE (1)	1	3C	Accumulation of abs value only if negative contribution
	Value	4	xxxxxxxx	Negative Active Power Line 3
L1 – L2	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	C0	
	DIFE (2)	1	80	
	DIFE (3)	1	40	Unit 5
	VIF	1	FD	Extension of VIF code
	VIFE (1)	1	48	0.1 V
	Value	4	xxxxxxxx	Voltage L1-L2
Q 1 +	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	C0	
	DIFE (2)	1	80	
	DIFE (3)	1	40	Unit 5
	VIF	1	AB	Var
	VIFE (1)	1	3B	Accumulation only if positive contribution
	Value	4	xxxxxxxx	Positive Reactive Power Line 1

Q 1 -	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	C0	
	DIFE (2)	1	80	
	DIFE (3)	1	40	Unit 5
	VIF	1	AB	Var
	VIFE (1)	1	3C	Accumulation of abs value only if negative contribution
	Value	4	xxxxxxxx	Negative Reactive Power Line 1
L2 – L3	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	80	
	DIFE (2)	1	C0	
	DIFE (3)	1	40	Unit 6
	VIF	1	FD	Extension of VIF code
	VIFE (1)	1	48	0.1 V
	Value	4	xxxxxxxx	Voltage L2-L3
Q 2 +	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	80	
	DIFE (2)	1	C0	
	DIFE (3)	1	40	Unit 6
	VIF	1	AB	Var
	VIFE (1)	1	3B	Accumulation only if positive contribution
	Value	4	xxxxxxxx	Positive Reactive Power Line 2
Q 2 -	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	80	
	DIFE (2)	1	C0	
	DIFE (3)	1	40	Unit 6
	VIF	1	AB	Var
	VIFE (1)	1	3C	Accumulation of abs value only if negative contribution
	Value	4	xxxxxxxx	Negative Reactive Power Line 1
L1 – L3	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	C0	
	DIFE (2)	1	C0	
	DIFE (3)	1	40	Unit 7
	VIF	1	FD	Extension of VIF code
	VIFE (1)	1	48	0.1 V
	Value	4	xxxxxxxx	Voltage L1-L3
Q 3 +	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	C0	
	DIFE (2)	1	C0	
	DIFE (3)	1	40	Unit 7
	VIF	1	AB	Var
	VIFE (1)	1	3B	Accumulation only if positive contribution
	Value	4	xxxxxxxx	Positive Reactive Power Line 3
Q 3 -	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	C0	
	DIFE (2)	1	C0	
	DIFE (3)	1	40	Unit 7
	VIF	1	AB	Var
	VIFE (1)	1	3C	Accumulation of abs value only if negative contribution
	Value	4	xxxxxxxx	Negative Reactive Power Line 3
	DIF	1	1F	More records will follow in next telegram
	Value	5	0000000000	PAD bytes
	Checksum	1	CS	
	Stop	1	16	

1.2.3 Telegram 3

	RSP_UD			
	Field Name	**Byte Number**	**Value**	**Meaning**
	Start	1	68	Start byte
	L-f	1	LEN	Frame number byte
	L-f	1	LEN	Frame number byte
	Start	1	68	Start byte
	C-f	1	08	RSP_UD
	A-f	1	**PADR**	0..250
	CI-f	1	72	Variable structure, LSB is trasmitted first
	Secondary address	4	IDENT	XXXXXXXX (8 BCD digits)
	Manufacturer code	2	A5 25	"IME" = 25A5
	Device version	1	**GEN**	Version
	Medium	1	02	Electricity
	Access number	1	TC	**incremented by 1 for any answered telegram**
	Status	1	STAT	Status for EN 1434-3 (*)
	Signature	2	00 00	**Not used**
PF	DIF	1	82	Instantaneous Value, 16-bit Integer
	DIFE (1)	1	80	
	DIFE (2)	1	80	
	DIFE (3)	1	80	
	DIFE (4)	1	40	Unit 8
	VIF	1	EE	Dimensionless (1.00 => 100)
	VIFE (1)	1	3B	
	Value	2	XXXX	Three phase power factor
PF-	DIF	1	82	Instantaneous Value, 16-bit Integer
	DIFE (1)	1	80	
	DIFE (2)	1	80	
	DIFE (3)	1	80	
	DIFE (4)	1	40	Unit 8
	VIF	1	EE	Dimensionless (1.00 => 100)
	VIFE (1)	1	3C	
	Value	2	XXXX	Three phase power factor
Frequency	DIF	1	82	Instantaneous Value, 16-bit Integer
	DIFE (1)	1	C0	
	DIFE (2)	1	80	
	DIFE (3)	1	80	
	DIFE (4)	1	40	Unit 9
	VIF	1	6E	Dimensionless (50.0 => 500)
	Value	2	XXXX	Frequency
CT Ratio	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	80	
	DIFE (2)	1	C0	
	DIFE (3)	1	80	
	DIFE (4)	1	40	Unit 10
	VIF	1	6E	Dimensionless (2000 / 5 => 400)
	Value	4	XXXXXXXX	Current ratio (KTA)
T ratio	DIF	1	84	Instantaneous Value, 32-bit Integer
	DIFE (1)	1	C0	
	DIFE (2)	1	C0	
	DIFE (3)	1	80	
	DIFE (4)	1	40	Unit 11
	VIF	1	6E	Dimensionless (= 10 always)
	Value	4	XXXXXXXX	Voltage ratio (KTV)
PF 1	DIF	1	82	Instantaneous Value, 16-bit Integer
	DIFE (1)	1	80	
	DIFE (2)	1	80	

	DIFE (3)	1	C0	
	DIFE (4)	1	40	Unit 12
	VIF	1	EE	Dimensionless (1.00 => 100)
	VIFE (1)	1	3B	
	Value	2	xxxx	Power factor line1
PF 1 -	DIF	1	82	Instantaneous Value, 16-bit Integer
	DIFE (1)	1	80	
	DIFE (2)	1	80	
	DIFE (3)	1	C0	
	DIFE (4)	1	40	Unit 12
	VIF	1	EE	Dimensionless (1.00 => 100)
	VIFE (1)	1	3C	
	Value	2	xxxx	Power factor line1
PF 2	DIF	1	82	Instantaneous Value, 16-bit Integer
	DIFE (1)	1	C0	
	DIFE (2)	1	80	
	DIFE (3)	1	C0	
	DIFE (4)	1	40	Unit 13
	VIF	1	EE	Dimensionless (1.00 => 100)
	VIFE (1)	1	3B	
	Value	2	xxxx	Power factor line2
PF 2 -	DIF	1	82	Instantaneous Value, 16-bit Integer
	DIFE (1)	1	80	
	DIFE (2)	1	80	
	DIFE (3)	1	C0	
	DIFE (4)	1	40	Unit 13
	VIF	1	EE	Dimensionless (1.00 => 100)
	VIFE (1)	1	3C	
	Value	2	xxxx	Power factor line2
PF 3	DIF	1	82	Instantaneous Value, 16-bit Integer
	DIFE (1)	1	80	
	DIFE (2)	1	80	
	DIFE (3)	1	C0	
	DIFE (4)	1	40	Unit 14
	VIF	1	EE	Dimensionless (1.00 => 100)
	VIFE (1)	1	3B	
	Value	2	xxxx	Power factor line3
PF 3 -	DIF	1	82	Instantaneous Value, 16-bit Integer
	DIFE (1)	1	80	
	DIFE (2)	1	80	
	DIFE (3)	1	C0	
	DIFE (4)	1	40	Unit 14
	VIF	1	EE	Dimensionless (1.00 => 100)
	VIFE (1)	1	3C	
	Value	2	xxxx	Power factor line3
	DIF	1	0F	Indicating that this is the last telegram
	Value	5	0000000000	PAD bytes
	Checksum	1	CS	
	Stop	1	16	

2. Initialization of Slave (SND_NKE)

To start or initialize the communication Master sends this telegram to Slave :

SND_NKE	
CODE	**Description**
10h	Start
40h	C field : initialization
PADR	A field : device address 0..250 /254/255
CS	CheckSum = (10h+40h+PADR) mod 100h
16h	Stop

If the Slave receives SND_NKE it resets TC counter of sent telegrams and answers with E5.

3. IME M-Bus telegrams (Mb1)

3.1 Request for Data (REQ_UD2)

REQ_UD2	
CODE	**Description**
10h	Start
5B/7Bh	C field : Request for Data
PADR	A field : device address 0..250 /254
CS	CheckSum = (10h+5B/7Bh+PADR) mod 100h
16h	Stop

When Master sends this telegram to a Slave, it answers a Standard Frame with RSP_UD multi-telegram, where the last DIF in the user data part of the telegram is 0x1F to indicate that there are more data in the next telegram.

Answer to Request for Data (REQ_UD2)

Position	**Description**	**Byte**	**Data type**
1	Active Total Energy	6	Type A , 12 BCD digits
2	Active Positive Power 3-phase	4	Type H , IEEE Real
3	Reactive Total Energy	6	Type A , 12 BCD digits
4	Reactive Positive Power 3-phase	4	Type H , IEEE Real
5	Active Partial Energy	6	Type A , 12 BCD digits
6	Active Negative Power 3-phase	4	Type H , IEEE Real
7	Reactive Partial Energy	6	Type A , 12 BCD digits
8	Not used	4	Type H , IEEE Real
9	Power Factor 3-phase	4	Type H , IEEE Real with sign
10	Error flags	1	Type B , 8-bit Integer
11	Current I1	4	Type H , IEEE Real
12	Current I2	4	Type H , IEEE Real
13	Current I3	4	Type H , IEEE Real
14	Voltage L1	4	Type H , IEEE Real
15	Voltage L2	4	Type H , IEEE Real
16	Voltage L3	4	Type H , IEEE Real
17	Active Power L1	4	Type H , IEEE Real with sign
18	Active Power L2	4	Type H , IEEE Real with sign
19	Active Power L3	4	Type H , IEEE Real with sign
20	Reactive Power L1	4	Type H , IEEE Real with sign
21	Reactive Power L2	4	Type H , IEEE Real with sign
22	Reactive Power L3	4	Type H , IEEE Real with sign
23	Power Factor L1(*)	4	Type H , IEEE Real with sign
24	Power Factor L2(*)	4	Type H , IEEE Real with sign
25	Power Factor L3(*)	4	Type H , IEEE Real with sign
26	Voltage L1-L2	4	Type H , IEEE Real
27	Voltage L2-L3	4	Type H , IEEE Real
28	Voltage L3-L1	4	Type H , IEEE Real
29	Neutro Current	4	Type H , IEEE Real
30	Frequency	4	Type H , IEEE Real
31	Current Transform Ratio KTA	2	Type B , 16-bit Integer
32	Voltage Transform Ratio KTV	2	Type B , 16-bit Integer

3.2 Examples of telegrams 1,2,3

3.2.1 Telegram 1

Example of the 1st telegram (all values are hexadecimal).

	RSP_UD			
	Field Name	**Byte n.**	**Value**	**Meaning**
	Start	1	68	Start byte
	L-f	1	LEN	Frame number byte
	L-f	1	LEN	Frame number byte
	Start	1	68	Start byte
	C-f	1	08	RSP_UD
	A-f	1	PADR	0..250
	CI-f	1	72	Variable structure ,LSB is transmitted first
	Secondary address	4	IDENT	XXXXXXXX (8 BCD digits)
	Manufacturer code	2	A5 25	"IME" = 25A5
	Device version	1	GEN	Version
	Medium	1	02	Electricity
	Access number	1	TC	incremented by 1 for any answered telegram
	Status	1	STAT	Status for EN 1434-3 (*)
	Signature	2	00 00	Not used
3-phase Et +	DIF	1	8E	Instantaneous Value, size 12 BCD digits
	DIFE	1	50	Tariff 1 Unit 1 Storage number 0
	VIF	1	04/05	Units kWh with resolution 0,01k/0,1k Wh
	Value	6	xxxxxxxxxx	3-phase Active Positive Energy
P +	DIF	1	85	Instantaneous Value, 32-bit Real
	DIFE	1	50	Tariff 1 Unit 1 Storage number 0
	VIF	1	2B	Power W
3-phase Er +	Value	4	xxxxxxxx	3-phase Active Positive Power
	DIF	1	8E	Instantaneous Value, size 12 BCD digits
	DIFE	1	90	Tariff 1
	DIFE	1	40	Unit 2
	VIF	1	04/05	Units kVArh with resolution 0,01k/0,1k VArh
	Value	6	xxxxxxxxxx	3-phase Reactive Positive Energy
Q +	DIF	1	85	Instantaneous Value, 32-bit Real
	DIFE	1	90	Tariff 1
	DIFE	1	40	Unit 2
	VIF	1	2B	Power Var
	Value	4	xxxxxxxx	3-phase Reactive Positive Power
Part Et +	DIF	1	8E	Instantaneous Value, size 12 BCD digits
	DIFE	1	60	Tariff 2 Unit 1 Storage number 0
	VIF	1	04/05	Units kWh with resolution 0,01k/0,1k Wh
	Value	6	xxxxxxxxxx	3-phase Partial Active Energy
P -	DIF	1	85	Instantaneous Value, 32-bit Real
	DIFE	1	60	Tariff 2 Unit 1
	VIF	1	2B	Power W
	Value	4	xxxxxxxx	3-phase Active Negative Power
Part Er +	DIF	1	8E	Instantaneous Value, size 12 BCD digits
	DIFE	1	A0	Tariff 2
	DIFE	1	40	Unit 2
	VIF	1	04/05	Units kVArh with resolution 0,01k/0,1k VArh
	Value	6	xxxxxxxxxx	3-phase Partial Reactive Energy

Not used	DIF	1	85	Instantaneous Value, 32-bit Real
	DIFE	1	A0	--
	DIFE	1	40	Unit2
	VIF	1	2B	--
	Value	4	xxxxxxxx	0
PF	DIF	1	05	Instantaneous Value, 32-bit Real
	VIF	1	FD	Power Factor
	VIFE	1	3A	Dimensionless
	Value	4	xxxxxxxx	b31 = sign| b30-b23 exponent| b22-b0 value
Err flags	DIF	1	01	Instantaneous Value, 8-bit integer
	VIF	1	FD	Error flags (**Not used - 00**)
	VIFE	1	17	
	Value	1	Yy	Error on 8 bit B7..B0
	DIF	1	1F	more records will follow in next telegram
	Value	5	0000000000	PAD bytes
	Checksum	1	CS	
	Stop	1	16	

3.2.2 Telegram 2

Example of the 2nd telegram (all values are hexadecimal).

	RSP_UD			
	Field Name	**Byte n.**	**Value**	**Meaning**
	Start	1	68	Start byte
	L-f	1	LEN	Frame number byte
	L-f	1	LEN	Frame number byte
	Start	1	68	Start byte
	C-f	1	08	RSP_UD
	A-f	1	PADR	0..250
	CI-f	1	72	Variable structure,LSB is trasmitted first
	Secondary address	4	IDENT	XXXXXXXX (8 BCD digits)
	Manufacturer code	2	A5 25	"IME" = 25A5
	Device version	1	GEN	Version
	Medium	1	02	Electricity
	Access number	1	TC	incremented by 1 for any aswered telegram
	Status	1	STAT	Status for EN 1434-3 (*)
	Signature	2	00 00	Not used
I 1	DIF	1	05	Instantaneous Value, 32-bit Real
	VIF	1	FD	Extension of VIF-codes
	VIFE	1	DA	Units A with resolution mA
	VIFE	1	FF	Next byte is manufacturer specific
	VIFE	1	01	Line 1
	Value	4	xxxxxxxx	Current L1
I 2	DIF	1	05	Instantaneous Value, 32-bit Real
	VIF	1	FD	Extension of VIF-codes
	VIFE	1	DA	Units A with resolution mA
	VIFE	1	FF	Next byte is manufacturer specific
	VIFE	1	02	Line 2
	Value	4	xxxxxxxx	Current L2
I 3	DIF	1	05	Instantaneous Value, 32-bit Real
	VIF	1	FD	Extension of VIF-codes
	VIFE	1	DA	Units A with resolution mA
	VIFE	1	FF	Next byte is manufacturer specific
	VIFE	1	03	Line 3
	Value	4	xxxxxxxx	Current L3
L1 - N	DIF	1	05	Instantaneous Value, 32-bit Real
	VIF	1	FD	Extension of VIF-codes
	VIFE	1	C8	Units V with resolution 100 mV
	VIFE	1	FF	Next byte is manufacturer specific
	VIFE	1	01	Line 1
	Value	4	xxxxxxxx	Voltage L1-N
L2 - N	DIF	1	05	Instantaneous Value, 32-bit Real
	VIF	1	FD	Extension of VIF-codes
	VIFE	1	C8	Units V with resolution 100 mV
	VIFE	1	FF	Next byte is manufacturer specific
	VIFE	1	02	Line 2
	Value	4	xxxxxxxx	Voltage L2-N
L3 - N	DIF	1	05	Instantaneous Value, 32-bit Real
	VIF	1	FD	Extension of VIF-codes
	VIFE	1	C8	Units V with resolution 100 mV
	VIFE	1	FF	Next byte is manufacturer specific
	VIFE	1	03	Line 3
	Value	4	xxxxxxxx	Voltage L3-N

DIF	1	1F	more records will follow in next telegram
Value	5	0000000000	PAD bytes
Checksum	1	CS	
Stop	1	16	

3.2.3 Telegram 3

Example of the 3rd telegram (all values are hexadecimal).

	RSP_UD			
	Field Name	**Byte n.**	Value	**Meaning**
	Start	1	68	Start byte
	L-f	1	LEN	Frame number byte
	L-f	1	LEN	Frame number byte
	Start	1	68	Start byte
	C-f	1	08	RSP_UD
	A-f	1	PADR	0..250
	CI-f	1	72	Variable structure,LSB is trasmitted first
	Secondary address	4	IDENT	XXXXXXXX (8 BCD digits)
	Manufacturer code	2	A5 25	"IME" = 25A5
	Device version	1	GEN	Version
	Medium	1	02	Electricity
	Access number	1	TC	incremented by 1 for any aswered telegram
	Status	1	STAT	Status for EN 1434-3 (*)
	Signature	2	00 00	Not used
P1	DIF	1	85	Instantaneous Value, 32-bit Real
	DIFE	1	40	Unit 1
	VIF	1	AB/AD	Power W/ 0,1 kW
	VIFE	1	FF	Next byte is manufacturer specific
	VIFE	1	01	Active Power Line 1
	Value	4	xxxxxxxx	b31 = sign| b30-b23 exponent| b22-b0 value
P 2	DIF	1	85	Instantaneous Value, 32-bit Real
	DIFE	1	40	Unit 1
	VIF	1	AB/AD	Power W/ 0,1 kW
	VIFE	1	FF	Next byte is manufacturer specific
	VIFE	1	02	Active Power Line 2
	Value	4	xxxxxxxx	b31 = sign| b30-b23 exponent| b22-b0 value
P 3	DIF	1	85	Instantaneous Value, 32-bit Real
	DIFE	1	40	Unit 1
	VIF	1	AB/AD	Power W/ 0,1 kW
	VIFE	1	FF	Next byte is manufacturer specific
	VIFE	1	03	Active Power Line 3
	Value	4	xxxxxxxx	b31 = sign| b30-b23 exponent| b22-b0 value
Q 1	DIF	1	85	Instantaneous Value, size 32-bit Real
	DIFE	1	80	
	DIFE	1	40	Unit 2
	VIF	1	AB/AD	Power Var / 0,1 kVAr
	VIFE	1	FF	Next byte is manufacturer specific
	VIFE	1	01	Reactive Power L1
	Value	4	xxxxxxxx	b31 = sign| b30-b23 exponent| b22-b0 value
Q 2	DIF	1	85	Istantaneous Value, size 32-bit Real
	DIFE	1	80	
	DIFE	1	40	Unit 2
	VIF	1	AB/AD	Power VAr/ 0,1 kVAr
	VIFE	1	FF	Next byte is manufacturer specific
	VIFE	1	02	Reactive Power L2
	Value	4	xxxxxxxx	b31 = sign| b30-b23 exponent| b22-b0 value

Q 3	DIF	1	85	Instantaneous Value, size 32-bit Real
	DIFE	1	80	
	DIFE	1	40	Unit 2
	VIF	1	AB/AD	Power Var / 0,1 kVAr
	VIFE	1	FF	Next byte is manufacturer specific
	VIFE	1	03	Reactive Power L3
	Value	4	xxxxxxxx	b31 = sign| b30-b23 exponent| b22-b0 value
PF 1	DIF	1	05	Instantaneous Value, 32-bit Real
	VIF	1	FD	Power Factor
	VIFE	1	BA	dimensionless
	VIFE	1	FF	
	VIFE	1	01	Power Factor Line 1
	Value	4	xxxxxxxx	b31 = sign| b30-b23 exponent| b22-b0 value
PF 2	DIF	1	05	Instantaneous Value, 32-bit Real
	VIF	1	FD	Power Factor
	VIFE	1	BA	dimensionless
	VIFE	1	FF	
	VIFE	1	02	Power Factor Line 2
	Value	4	xxxxxxxx	b31 = sign| b30-b23 exponent| b22-b0 value
PF 3	DIF	1	05	Instantaneous Value, 32-bit Real
	VIF	1	FD	Power Factor
	VIFE	1	BA	dimensionless
	VIFE	1	FF	
	VIFE	1	03	Power Factor Line 3
	Value	4	xxxxxxxx	b31 = sign| b30-b23 exponent| b22-b0 value
L1 – L2	DIF	1	05	Instantaneous Value, size 32-bit Real
	VIF	1	FD	Extension of VIF-codes
	VIFE	1	C8	Units V with resolution 0,1V
	VIFE	1	FF	Next byte is manufacturer specific
	VIFE	1	04	
	Value	4	xxxxxxxx	Voltage L1-L2
L2 – L3	DIF	1	05	Instantaneous Value, size 32-bit Real
	VIF	1	FD	Extension of VIF-codes
	VIFE	1	C8	Units V with resolution 0,1V
	VIFE	1	FF	Next byte is manufacturer specific
	VIFE	1	05	
	Value	4	xxxxxxxx	Voltage L2-L3
L3 – L1	DIF	1	05	Instantaneous Value, size 32-bit Real
	VIF	1	FD	Extension of VIF-codes
	VIFE	1	8	Units V with resolution 0,1V
	VIFE	1	FF	Next byte is manufacturer specific
	VIFE	1	06	
	Value	4	xxxxxxxx	Voltage L3-L1
I Neutro	DIF	1	05	Instantaneous Value, size 32-bit Real
	VIF	1	FD	Extension of VIF-codes
	VIFE	1	DA	Units A with resolution 10 mA
	VIFE	1	FF	Next byte is manufacturer specific
	VIFE	1	04	
	Value	4	xxxxxxxx	Neutro Current

Freq.	DIF	1	05	Instantaneous Value, size 32-bit Real
	VIF	1	FF	Next byte is Manufacturer specific
	VIFE	1	5A	Units Hz with resolution 0.1 Hz
	Value	4	xxxxxxxx	Frequency
KTA	DIF	1	02	Instantaneous Value, size 16-bit integer
	VIF	1	FD	
	VIFE	1	3A	dimensionless
	Value	2	xxxx	Current Transform KTA
KTV	DIF	1	02	Instantaneous Value, size 16-bit integer
	VIF	1	FD	
	VIFE	1	3A	dimensionless
	Value	2	xxxx	Voltage Transform KTV *10
	DIF	1	0F	Indicating that this is the last telegram
	Value	5	0000000000	PAD bytes
	Checksum	1	CS	
	Stop	1	16	

4. Read the primary address

Type : long frame

To read Primary Address send a SND_UD telegram and then REQ_UD2.
This command must be sent in a point to point mode to read out the primary address of a device which the user doesn't know the primary address of (so the demand is in broadcast).

Field Name	Number of byte	Value	Meaning
Start	1	68h	Start
L-f	1	05h	Header
L-f	1	05h	
Start	1	68h	
C-f	1	53h/73h	SND_UD
A-f	1	FE	Broadcast Address
CI-f	1	51h	Data send
DIF	1	08h	Selection for Readout
VIF	1	7Ah	
Check Sum	1	CS	
Stop	1	16h	Stop

Reading example of primary address 1 :

SND_UD	68 05 05 68 53 FE 51 08 7A 24 16
E5h	E5
REQ_UD2	10 7B FE 79 16
RSP_UD	68 12 12 68 08 01 72 00 00 00 00 A8 15 00 02 9E 00 00 00 01 7A 01 54 16

Answer : 01 7A 01 (in blue) : last 01 is the device primary address

5. Read of the secondary address

Type : long frame

To read the Secondary Address send a SND_UD telegram and then REQ_UD2 :

Field Name	Number of byte	Value	Meaning
Start	1	68h	Start
L-f	1	05h	Header
L-f	1	05h	
Start	1	68h	
C-f	1	53h/73h	SND_UD
A-f	1	PADR	Primary Address
CI-f	1	51h	Data send
DIF	1	08h	
VIF	1	79h	
Check Sum	1	CS	
Stop	1	16h	Stop

Reading example of secondary address 12345678 :

SND_UD	68 05 05 68 73 FE 51 08 79 43 16
E5h	E5
REQ_UD2	10 5B FE 59 16
RSP_UD	68 15 15 68 08 01 72 78 56 34 12 A8 15 00 02 0E 00 00 00 0C 79 78 56 34 12 F5 16

Primary address : FE (in this broadcast – point to point – just for example)
Secondary address : **78 56 34 12** (8 BCD digits) but LSB before and MSB at the end so :
Real value : **12 34 56 78**

6. Application Reset

Type : control frame

CONTO D4 Pd allows the application reset command
After this message the device resets the answer counter, the pending selection frame, the error flags and responds with the ACK character (E5h) :

Field Name	Byte n.	Value	Meaning
Start	1	68h	
L-f	1	03h	Header
L-f	1	03h	
Start	1	68h	
C-f	1	53h/73h	SND_UD
A-f	1	PADR	Primary Address
CI-f	1	50h	Application reset
Check Sum	1	CS	
Stop	1	16h	

7. Selection through Secondary Addressing

In an M-Bus network it is possible to have maximum 250 participants primary addresses, from 1 to 250. The address 0 is used for a not configured device.

If there are more than 250 devices, it is mandatory to use the secondary address.

Master sends the following SND_UD telegram to a Slave to select it :

Field Name	Byte n.	Value	Meaning
Start	1	68h	
L-f	1	0Bh	Header
L-f	1	0Bh	
Start	1	68h	
C-f	1	53h/73h	SND_UD
A-f	1	FDh	Primary Address
CI-f	1	52h	
Value	4	X1X0 X3X2 X5X4 X7X6	Secondary Address
Manufacturer code	2	A5 25	"IME" = 25A5
Device version	1	Binary	Version (1.00 => 100 = 64h)
Medium	1	02	Electricity
Check Sum	1	CS	
Stop	1	16h	

The Primary address used is FDh

If there is a Slave having the Secondary Address specified X7X6X5X4X3X2X1X0, with the right Manufacturer code, Device version and Medium it will respond with an ACK (0xE5) character otherwise there will be no answer.

If the Slave is correctly selected, it changes its state in "selected" . This means that it will answer with a RSP_UD to all commands REQ_UD2, issued to the Slave.

The Slave remains in a "selected" state until it receives either a selection command to a different Secondary Address or a SND_NKE command to Address 0xFD.

In the Selection command it is allowed to use 0xF wild card instead of any digit of Manufacturer code, Device version and Medium. For example 0xFFFF instead of 0xA525, 0xFF instead of 0x1D and 0xFF instead of 0x02.

Example

Secondary address :

```
M => S    [68][0b][0b][68][53][fd][52][02][00][00][00][a5][25][14][02][8d][16]
S => M    [E5]
```

8. FCB bit management

A generic MBUS message in short frame is the following :

10 hex (START Byte)
C field (Function Code)
A field (Address of slave)
16 hex (STOP Byte)

The Function Code specifies the direction of data flow, and is responsible for various additional tasks in both the calling and replying directions.

Table below shows the coding of the individual bits of the C field:

Bit Number	7	6	5	4	3	2	1	0
Calling Direction	0	1	FCB	FCV	F3	F2	F1	F0
Reply Direction	0	0	ACD	DFC	F3	F2	F1	F0

Fig. *Coding of the Control Field*

Bit 7 : it is reserved for future functions, and at present is 0
Bit 6 : it is used to specify the direction of data flow (1 = Master to Slave; 0 = Slave to Master).
Frame Count Bit FCB :
it is toggled when the slave has answered correctly. E.g. master sends FCB=0 , slave returns a valid answer, master sends FCB=1 and vice versa (0 .. 1 .. 0)
Frame Count Bit valid FCV :
0 : the toggle management must be ignored
1 : the toggle management must be used
Bits F3 F2 F1 F0 : they specify the function that must be performed by the slave.

If answered data by the slave are longer than a single telegram, then multi-telegram management is needed.

Master : sets FCV = 1 and toggles FCB (it means last telegram was received correctly)
Slave : if the FCB has been toggled then it responds with the next telegram. If FCB is the same as in the previous message, then it responds with the same telegram (reply).

Examples :

Without errors (FCB toggles)
M => REQ_UD2 with FCB = 1 e FCV = 1 : 10 **7B** 01 7C 16
S => 1st telegram
M => REQ_UD2 with FCB = 0 e FCV = 1 : 10 5**B** 01 5C 16
S => 2nd telegram
M => REQ_UD2 with FCB = 1 e FCV = 1 : 10 **7B** 01 7C 16
S => 3rd telegram
M => REQ_UD2 with FCB = 0 e FCV = 1 : 10 5**B** 01 7C 16
S => 1st telegram

With errors
M => REQ_UD2 with FCB = 1 e FCV = 1 : 10 **7B** 01 7C 16
S => 1st telegram
M => S REQ_UD2 with FCB = 0 e FCV = 1 : 10 5**B** 01 5C 16
S => 2nd telegram
M => REQ_UD2 with FCB = 0 (not toggled) e FCV = 1 : 10 5**B** 01 7C 16
S => 2nd telegram
M => REQ_UD2 with FCB = 1 e FCV = 1 : 10 7**B** 01 7C 16
S => 3rd telegram

ATTENTION

Any way, even if a selection through the secondary address is used, the FCB bit must be toggled.
This is very important as if a master issues a new selection and then a message without toggling the FCB bit, the slave understands that the master is demanding the old telegram again.

Examples :

1. Master : Selection through secondary address
2. Slave responds E5
3. Master : REQ_UD2 FCB = 0
4. Slave responds with telegram 1
5. Master : REQ_UD2 FCB = 1
6. Slave responds with telegram 2
7. Master : REQ_UD2 FCB = 0
8. Slave responds with telegram 3
9. Master : Selection through secondary address

Case 1
10. Master : REQ_UD2 FCB = 0 == WARNING ==
11. Slave responds with telegram 3

Case 2
12. Master : REQ_UD2 FCB = 1 == CORRECT ==
13. Slave responds with telegram 1